



Graphic support resources for workers with intellectual disability engaged in office tasks: a comparison with verbal instructions from a work mate

María-Teresa Becerra, Manuel Montanero & Manuel Lucero

To cite this article: María-Teresa Becerra, Manuel Montanero & Manuel Lucero (2016): Graphic support resources for workers with intellectual disability engaged in office tasks: a comparison with verbal instructions from a work mate, *Disability and Rehabilitation*, DOI: [10.1080/09638288.2016.1258739](https://doi.org/10.1080/09638288.2016.1258739)

To link to this article: <http://dx.doi.org/10.1080/09638288.2016.1258739>



Published online: 15 Dec 2016.



Submit your article to this journal [↗](#)



Article views: 28



View related articles [↗](#)



View Crossmark data [↗](#)

ORIGINAL ARTICLE

Graphic support resources for workers with intellectual disability engaged in office tasks: a comparison with verbal instructions from a work mate

María-Teresa Becerra, Manuel Montanero and Manuel Lucero

Department of Educational Sciences, Faculty of Education, University of Extremadura, Badajoz, Spain

ABSTRACT

Background: Research into workplace adjustments for people with disabilities is a fundamental challenge of supported employment. The aim of the present work is to investigate the effect of several graphic resources as natural support for workers with intellectual disability.

Methods: Two case studies were conducted to assess the performance of five workers engaged in office tasks, with three different support conditions.

Results: Results reveal a 20% increase in quality of performance of the tasks undertaken with graphic support as compared to support in which the participants received verbal instructions (VIs) from a work mate; and between 25 and 30% as compared to a control condition which included no help of any kind.

Conclusions: These findings are consistent with previous studies which support the possibility of generating, at low cost, iconic materials (with maps or simple graphics), which progressively facilitate workers' autonomy, without dependence or help from the job trainer. We observed that the worst performance is in the support condition with VIs, this shows the limitations of this type of natural support, which is provided on demand by work mates without specialist knowledge of work support.

ARTICLE HISTORY

Received 30 December 2015

Revised 23 October 2016

Accepted 6 November 2016

KEYWORDS

Intellectual disability;
supported employment;
natural support; visual
support; training;
self-regulation

► IMPLICATIONS FOR REHABILITATION

- We studied the use of various types of natural support for people with intellectual disability in their workplace.
- The findings suggest that, with some brief training, the simple use in the workplace of graphic help on a card can increase between 20 and 30% the quality of performance of certain work tasks carried out by workers with intellectual disability.
- This advantage contrasts with the high cost or lower "manageability" of other material resources of natural support based on the use of technology.

Introduction

People with intellectual disabilities aspire to decent work as the rest of people in our society.[1] One of the most relevant measures to promote personal advancement, quality of life, and social inclusion of people with disability is *Individual Placement and Support in the workplace*. [2–5] *Individual Placement and Support in the workplace* is a modality of access to employment of persons with disabilities. According to the European Union of Supported Employment, this modality aims to provide support to people with disabilities and other disadvantaged groups to ensure and maintain gainful employment in the open labour market. This measure requires continuous and flexible support, together with a series of adjustments in accordance with the needs of each a person with disability.[6]

The majority of the supported employment programmes for people with intellectual disability are based on the "place and train" approach, with a combination of training and support actions both in and out of the company. The most recurrent strategy consists of initial supervision of disabled workers' tasks by an occupational monitor or job coach in the work place,[7,8] combined with training sessions on work and transversal competences out of the workplace. However, most of the programmes lack

sufficiently systemized actions to facilitate natural support in the work setting.[9] *Natural support* is not only human resources (co-workers), providing guidance and assistance to workers when needed, but also other resources, such as technology and materials to facilitate work tasks, which permit workers with disabilities to undertake a progressively higher degree of autonomy.

Evidence exists of the advantages of planning human and material resources of natural support for workers with disability (for a review see [10,11]). Natural support should be available in the work setting, conveniently and economically, without the need for the more or less constant presence of a job coach.[12–14] This circumstance in addition facilitates the progressive feeling of autonomy in the workplace, which is one of the most relevant aspects in work satisfaction for people with intellectual disability.[15]

Design of these types of support is determined not only by the nature of the work tasks, but also by the needs of the workers with disabilities, the characteristics of the work mates, and the culture of the workplace.[16,17] Recent research shows that technology has the potential to enable individuals with intellectual disabilities to better performance of vocational tasks in supported employment.[18] In the case of the workers with intellectual disability (WID), of particular use are audiovisual supports, based on

Table 1. Participants (Study I).

	Workers with intellectual disability						
	Sex	Age	Impairment level	IQ	Scholar level	Marital status	Socioeconomic level
1	Man	24	65%	67	Elementary education	Single	Medium
2	Man	20	65%	65	Elementary education	Single	Low
3	Woman	18	33%	80	Elementary education	Single	Medium-low

images and audio recordings,[19,20] segmented at each of the steps into which the work tasks can be split [21,22]: schedules, data log sheets, operation sequence diagrams, organization charts, blueprints or plans, visual light indicators of start and finish of tasks, pictograms or photographs to organize work time and space, etc.[23–26] These materials are used to remember *self-instructions* or to clarify action sequences required to carry out a particular work task, using verbal and iconic visual keys, according to the type and degree of disability.[24] It has been shown that these kinds of resources facilitate the acquisition of skills and enhance work performance, without having to invest excessive time or resources.[27–33] Other studies have demonstrated the efficacy of watching self-modelling videos, for tasks that do not have an excessive number of steps.[34,35]

From a review of investigations and experiments, some of which are scarcely documented, on the use of visual resources as natural support, we can infer several reasons to justify the need to expand this line of investigation. The scarcity of research focusing explicitly and rigorously on the use of these kinds of resources in the work setting of people with mild intellectual disability is evident. Furthermore, previous studies have dealt mainly with more or less routine or "mechanical" tasks, that is, those which rarely require decision-making or self-regulation strategies.[36,37]

To self-regulate is not enough to have knowledge. Trainees must also develop cognitive skills to plan, self-evaluate, and review used strategies, in order to exercise control over the learning processes.

Learning to learn competence involves ability to develop these procedures in a self-regulating way, that is, adapting consciously such actions to conditions presented by each task at every moment of performance process.

It would seem, therefore, that there is a need to investigate specifically the usefulness of simple resources that provide support in planning, self-supervision, and self-regulation of work tasks.[21,31] In the case of planning, we should pose the question of to what extent these resources can help WID to anticipate and face up to the difficulties derived from the context where the different work tasks are carried out (for instance, receiving several requests at once, time constraints, office furniture changes, and other unexpected events, etc.).With regard to self-supervision and self-regulation, these resources can be used to assess the process and results of relatively complex work tasks, and to provide reflection on more effective strategies.

Study I

The *aim* of this first study was to compare work achievement by WID under different conditions of natural support in the work setting, without the help of a specialized job coach. In a preliminary investigation, we found evidence of usefulness of graphic support (GS) materials to improve autonomy and efficacy of WID.[36] In the present study, we decided to measure again the specific effect of these kinds of resources, though not simply as one more component of a work support programme, but in an isolated way in order to compare them with what is probably the most widely

used natural support in work situations, i.e., pragmatic speech help, given by the work mates of the workers with disabilities.

Method

Participants

The participants in this first study were three WID who were starting trainee sessions as administrative assistants in a public office (see Table 1).¹

The researchers first obtained permission from the management of the organizations to implement and conduct the research. Workers were selected thanks to a collaboration agreement with an association to support people with intellectual disabilities (AFEDIBA). Aided by an Association employee, we offered them sufficient information about the purpose and nature of the experience. All of them voluntarily consented to take part in the research and they were highly motivated. We assure the anonymity of the participants ... The workers' recruitment criteria were in accordance with the ethical approval of the institution which funded this research.

Two of the participants were men, 24 and 20 years old, and with similar disabilities (IQs 67 and 65). They were recognized by Social Services as having the same impairment level (65%). They both also had a similar level of competence in reading/writing skills and mathematics, equivalent to second year of Primary Education (7–8 years). With regard to social competence, WID1 coped adequately in heterogeneous groups, although he had difficulties in handling conflictive situations. Occasionally he misrepresented situations and conversations relating to himself, and fibbed or lied compulsively. WID2 had more difficulty interacting with people without disability, and with oppositional-defiant behaviours in the company of work mates in social complex situations (e.g., practical jokes). Both workers were self-dependent in travelling to and from the work place, but less so in their personal care and hygiene (for which they needed help or supervision).

The third participant (WID3) was a young woman (18 years), with an IQ of 80 and an impairment level of 33%. Her level of reading and writing skills and mathematics was similar to the other two participants, equivalent to third year of Primary Education (8–9 years). She achieved good social integration, both with known and unknown people, and she was extrovert in her behaviour. She was completely self-dependent in her personal care and was mostly able to go by herself to and from work.

Design

The investigation was based on an observational multiple case study design, with the aim of analysing the efficacy of different conditions of natural support. Performance by the three participants was assessed in three work tasks: photocopying, obtaining documents, and transferring to the right place and person. In each of these, additionally, three conditions of work support were balanced: GS, verbal instructions (VIs), and without help (WH) (Table 2). The work tasks and support conditions are described in more detail as follows.

Table 2. Sequence of work tasks and support conditions for each worker with intellectual disability (WID) in Study I: WH (without help); VI (verbal instructions); GS (graphic support).

Tasks Participants	Photocopying			Obtaining documents			Transferring to the right place and person		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
WID1	SA	IV	AG	AG	SA	IV	IV	AG	SA
WID2	IV	AG	SA	SA	IV	AG	AG	SA	IV
WID3	AG	SA	IV	IV	AG	SA	SA	IV	AG

Tasks

Participants had to perform three types of work tasks which were typical of the job. For the photocopying task, the worker with intellectual disability was responsible for making copies (of different types) and for providing documents requested by other workers. The worker often received several requests for photocopies at once. The photocopier in the office was a machine of over 200 kg, with a control panel which offered multiple functions in addition to copying, such as binding, classifying, grouping, reducing, enlarging, and stapling.

The task of *obtaining filed documents* consisted of taking previously classified paper documents (certificates of training courses completed by service users) from conventional drawers and folders.

The task of *transferring to the right place and person* arose when a visitor required information or made a request which did not correspond to the worker who received it. In this case it was necessary to identify the work colleague who could attend to this request and inform the visitor where among the various sections (13 work spaces) the correct staff member could be found.

To assess the quality of performance of each of the tasks, a scale of appreciation, in rubric format, was made up, with eight criteria and four levels of execution for each criterion. Each level of execution described not only how the different operations within each task should be performed, but also what strategic decision-making was involved in the phases of planning, execution and evaluation of the task.

Work support conditions and materials

The VI support condition allowed the worker to request help from a non-disabled work mate, who would fulfil natural support functions. This work mate could offer the necessary verbal guidance to perform the task, but not carry it out.

Under the GS condition, no help was received from work mates, but the WID had access free to a graphic resource, previously designed by the researchers.

For the *photocopying* task, GS consisted of a data log sheet of requests, based on a simple table with different sections in which the characteristics of the request could be noted in an orderly fashion: requester, number of copies, size (same size, reduced, enlarged), format (one side/both sides, stapled, etc.). In the last section, the worker could note down any observations that did not appear in the table which he/she considered relevant, such as priority or day of delivery (see [Figure 1](#)).

For the task of *obtaining filed documents*, the graphic resource consisted of a system in which the hierarchical organization of the file was represented by concentric squares. In the largest square, the symbol of the general category (training course and year) appeared; the middle square contained the number of the edition of the course; and the smallest square showed the dossier number.

For the task of *transferring to the right place and person*, an *organization chart* of company section heads and services was made up, together with a sketch of their location in the building. This chart allowed workers with disability to rapidly locate an employee who was required to attend to a visitor, and they could also show it to visitors to help them find the required section.

Materials were identical for all participants and were adapted to their needs. These materials were designed entirely by researchers. The control condition, WH, obliged the worker to perform each task on his/her own, without requesting or obtaining help from work mates.

Procedure

- Preparation.** When the trainee WID began work at the company, each was assigned a work companion to provide them with natural support when carrying out work tasks. On the first day, the WIDs met the staff, were shown round the building and were informed of their responsibilities and tasks. On the first and second day they received, additionally, a training course of approximately three hours' duration on the work tasks that they would be required to do, and on how to handle materials and office equipment. Their work colleagues received brief information on how to provide VIs (though without actually doing the task required by the worker with disability).
- Undertaking and recording of work tasks.** The workers with disability performed three types of tasks on three consecutive days. Each day they were assessed on a task and a different support condition. The order of the work conditions was established as shown in [Table 1](#).

Each worker with disability received three verbal requests for each task and support condition, that is, 27 requests in total (identical for the three workers with disability). For example, the first photocopying request was the following: "Could you please make me three photocopies of this document one side only, five double-sided unstapled copies (sheets were printed on one side only) of this one, and four copies of these (sheets were printed on both sides) on one side only, and stapled?". The first request to obtain filed documents was: "Could you please find the dossier on Javier G.F., who did the Pedagogic Aptitude Course in 2007 (the WID was required to find out the remaining information in order to locate the name)?" The first request *transferring to the right place and person* and guide a visitor was made by an "actor" who was not involved in the investigation: "Hello, I've come for the Computer Studies Course".

The 27 requests and executions were recorded by video camera for subsequent assessment. Other work tasks (making up lists on the computer, binding copies, answering the telephone, etc.) occurred between these requests so that execution was as natural as possible.

- Assessment of tasks.** In order to assess the quality of the execution process of each of the requests, two of the researchers separately examined the overall recordings, using the three rubrics, one for each work task, described in the section on materials. On average, there was 81.3% agreement. Interjudge reliability, estimated using Kappa-Cohen's index, was 0.7 ($p < 0.01$). Discrepancies were discussed and resolved by consensus between the researchers.

Finally, the results of the rubric under the different support conditions were quantified. One point was awarded if the level of execution shown by the worker in one criterion was lowest (bad), two points were given if performance was on the second level (average), three points if it was on the third level (good), and four






People	Subject	Number	Side				Stapled		Observations
			 1 side → 1 side	 1 side → 2 sides	 2 sides → 2 sides	 2 sides → 1 side		No	

Figure 1. Graphic resource used in photocopying task.

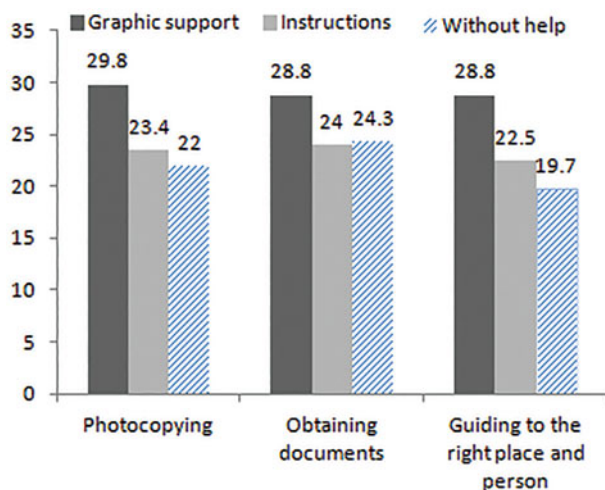


Figure 2. Averages of results obtained from the assessment rubrics on work tasks under different support conditions.

points if it was on the fourth level of execution (very good). The rubrics had eight criteria, and so the maximum score that could be obtained in the assessment of each work request was 32 points. So, we could quantify performance quality average of every task in different experimental conditions, and the percentage difference between these averages.

Results

Figure 2 shows the average scores of the work tasks carried out by the workers under different support conditions. Globally, the work tasks were performed much better in the GS condition (20.1% better than with VIs and 24.5% better than the “without help” control condition). The only exceptions were in the obtaining documents task, in which WID1 achieved slightly better results with the instructions of his work mate; and WID3 had a higher score WH than with instructions.

The multivariate analysis of variance (MANOVA), used for observation of the triple response in each of the support conditions, did not detect a significant effect in the characteristics of the participants ($p=0.16$), nor in the order of performance of the request ($p=0.95$). On applying a model of repeated measures (Greenhouse–Geisser correction), there were no significant differences between the work tasks ($p=0.57$), although there were significant differences between the average scores of the GS condition and the VI condition ($F=20.02$; $p<0.01$). The Wilcoxon test, however, did not detect significant differences between the VI condition and the WH control condition ($p=0.12$).

In contrast, the GS condition did not reveal a greater effect in any of the specific processes of self-regulation. The scores

obtained in the criteria relating to planning of the task are in all cases slightly superior to those relating to processes of *execution* and *evaluation* (except in the verbal support and control conditions of the *transferring to the right place and person* task).

Study II

In the previous study, we opted for a multiple case study design which presented certain *limitations*, such as degree of intellectual disability of the participants, the intrinsic difficulty of the tasks, or accumulated practice. We have attempted to control these unusual variables by balancing several measures in each support condition and statistically controlling their effect. The inferential analyses, however, do not provide absolute certainty, given the small number of participants which we had the opportunity to assess. For this reason, in the second study our objective was to replicate the assessments of the GS condition with new cases and another type of design. Since it is very difficult, in research on employment, to find sufficient workers to make up a control group under homogeneous working conditions, an alternative consists of parallel and repeated observation of each participant carrying out a supported task and a non-supported task. Despite the fact that the same hours are accumulated in both types of tasks, less improvement would be expected to be found in the non-supported work than in the supported one, that is, we would expect to observe a different trend in the time series of the two tasks.

Method

Participants

In this second study, the participants were two trainee workers, different from those in Study I (see Table 3).

Worker with disability number 4 (WID4) was a man of 34 years, with an IQ of 69 and a recognized impairment level of 68%. His competence level in reading/writing and mathematics was equivalent to second year of Primary Education (7–8 years), and he had speaking difficulties (substitution or occasional omission of phonemes or syllables). He had no difficulty in integrating with his peers, though he did with unknown people (he became very shy and introverted). He was completely self-sufficient in his personal care and in travelling to and from work, and to other known places (but he needed a lot of help to go to places he had not previously visited).

The last of the trainees (WID5) was a woman of 29 years, with an IQ of 66 and a recognized impairment level of 33%. Her competence in reading/writing and mathematics was equivalent to third year of Primary Education (8–9 years), with slight attention difficulties. She was able to interact adequately in peer groups, but had greater difficulty with unknown people. She was completely self-sufficient in her personal care, although she

Table 3. Participants (Study II).

Workers with intellectual disability							
	Sex	Age	Impairment level	IQ	Scholar level	Marital status	Socioeconomic level
4	Man	34	68%	69	Elementary education	Single	Low
5	Woman	29	33%	66	Elementary education	Single	Medium

Table 4. Sequence of work tasks and support conditions for each worker with intellectual disability (WID) in Study II: WH (without help); GS (with graphic support).

Participants	Task	Work support condition		
		WH	GS	WH
WID4	Photocopying	WH	GS	WH
	Folding-putting documents into envelopes	WH	WH	WH
WID5	Photocopying	WH	WH	WH
	Folding-putting documents into envelopes	WH	GS	WH

occasionally experienced certain problems of confusion travelling to and from the work place.

Design

The study was based on an interrupted time series design with nonequivalent dependent variables, aimed at analysing the efficacy of a GS resource in self-regulation of work tasks with office machines. Assessment was made of the performance of the two workers in two different work tasks (photocopying and putting documents into envelopes), under two different support conditions (GS and WH).

As with the previous study, the sequence of conditions was balanced, as Table 4 shows. In this way, the control condition WH permitted us to verify whether the results generated under the GS condition were due merely to the fact that the participants had accumulated more experience in the task.

Tasks and materials

Two types of work tasks, which required handling of office machinery, were assessed: photocopying and putting documents into envelopes. The photocopier was the same as in the previous study. In the folding and putting into envelopes task, the worker with disability was required to fold a document (with a variable number of folds), put it into an envelope (there were different types of envelopes), and deliver to the staff member who had requested it. A fold-up machine weighing 8.5 kg with four folding formats was used.

In order to analyse the quality of the execution of the photocopying tasks, the same rubric was used as in the previous study (although as a result of the assessment experience of Study I it was decided to divide into two one of the criteria on the execution process) (see Appendix). For the folding-putting into envelope task, a rubric was made up, with nine very similar criteria, and with four levels of execution described for each criterion. The maximum score which could be obtained in both rubrics, therefore, was 36 points.

Work support conditions

Under the GS condition, the participant had access to a graphic resource for self-regulation support. The participant could not receive any other type of help. Under the WH control condition, the WID had to carry out a task on his/her own without requesting or obtaining support from work colleagues.

Procedure

The procedure was similar to that employed in Study I. On this occasion two work tasks were selected: one identical to the previous study (photocopying) and the other new (folding and putting documents into envelopes). As we said before, the tasks were assessed under two conditions: with GS and WH. The GS resource for the photocopying task was identical to that used in Study I. For the task of folding and putting documents into envelopes a new graphic resource was created. This consisted of a simple table with different sections for noting down in an orderly way the requester and the request made: amount, type of fold (letter fold, zig-zag, parallel ...) and the type of envelope (large, small, with window ...). In the last section, the worker could note down any observations regarding anything that did not appear in the table, such as priority or day of delivery.

Each day the participants carried out two requests for each work task (12 requests in total). The first participant, WID4, performed the photocopying task with and without support; for the task of putting a document into an envelope the participant received no GS. The second participant, WID5, did just the opposite: she received no help in any of the assessments of the photocopying task but did require support on one of the days when she had to put documents into envelopes. The participants received two requests for each task and support condition, that is, 12 requests in total (identical for the two workers).

Finally, in order to assess the audiovisual registers of the photocopying and putting documents into envelopes tasks (with and without support), the two observation registers were applied in rubric form, as described in the section on materials.

Results

The following graphs reflect the averages obtained by the participants in the different sequences of execution of the work requests. The first worker received no support in any of the folding-putting into envelopes requests, but was permitted to use the GS for the photocopying requests (Figure 3). With the other worker, the opposite occurred: she only needed to use the GS in the intermediate requests of the folding-putting into envelopes requests (Figure 4).

As can be seen quite clearly, the assessment of work tasks follows a very similar pattern in both workers. When the participants had access to GS, the quality of the tasks clearly improved, as compared to when they received no type of help. Once again, if we analyse the total scores obtained by the participants in the full set of rubrics, the work tasks are performed overall 29.8% better under the GS condition than under the control condition WH.

This result does not seem to be affected by the nature or facility of the task. WID1 obtained best results when he used GS for the photocopying task, and the same occurred with WID2 for the task of putting documents into envelopes.

The effect of support is also greater than participants' accumulated practice over the different assessments. In the following graphs it can be seen, in fact, that the results of the task in which the workers do not use the visual support resource show a

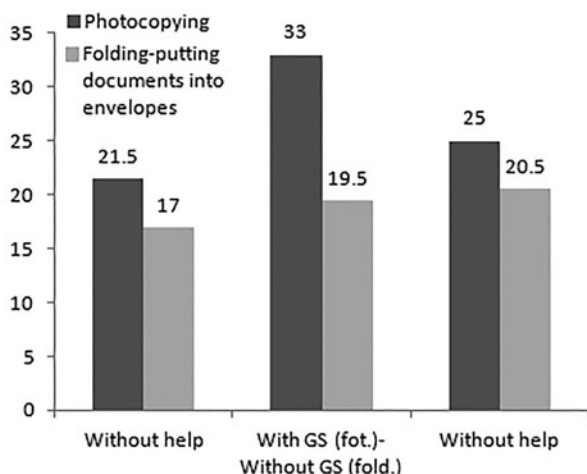


Figure 3. Averages of the results obtained in the assessment rubrics of the work tasks by the first worker with disability (WID4) in the sequence of conditions without graphic support and with graphic support (GS).

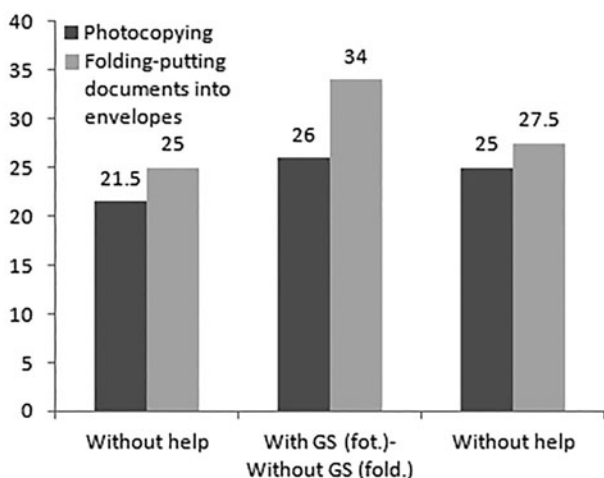


Figure 4. Averages of the results obtained in the assessment rubrics of the work tasks by the second worker with disability (WID5) in the sequence of conditions without graphic support and with graphic support (GS).

gradual improvement, but this improvement is not comparable to that achieved under support conditions.

General discussion

Supported employment is an evidence-based practice defined as employment for people with disabilities to ensure and maintain gainful employment in the competitive labour market. Most studies have examined individual factors of employees with intellectual disability such as motivation,[38] competence,[4,39] and working behaviour.[40] However, they do not take into account a component that affects successful work outcomes, which are the specific kinds of resources and conditions required by the effective implementation of the different work tasks for people with intellectual disabilities. In this sense, few studies have focused on activities for performing job tasks in clerical work in regular paid employment. The present research focuses on the effect of several resources to improve the autonomy and efficacy of WIDs without the help of a specialized job coach.

There are studies which have provided insight into some important aspects of work environment encompassing job content, requirement, and performance.[17] However, these interventions are often impractical for financial and structural reasons. Consequently, we incorporated financially feasible supports which provide a more natural and efficient basis for enhancing a person's independence, productivity, and community integration.

More specifically, in this research we studied the use of various types of natural support for people with intellectual disability in their workplace. The findings from the above studies suggest that, with some brief training, the simple use in the workplace of graphic help on a card can increase between 20 and 30% the quality of performance of certain work tasks carried out by WIDs. In addition, the results do not refer simply to a reduction of support needed by workers, but that they also reflect a significant improvement in the performance of work tasks according to the rubric used (see Appendix). These levels of work performance were higher than those observed under other conditions of natural support in which, instead of giving workers with disability access to visual support, they were allowed to ask for help from non-disabled work mates, who then gave them VIs.

The data relating to the effect of this second condition of natural support were, in fact, similar to the *control* condition, under which the workers received no type of help at all. With slight variations, these results follow a similar pattern for the three work tasks and for the three participants studied, despite the fact that they did not present the same personal conditions of disability. The effect of support has been shown to be much more relevant than accumulated practice in the performance of work tasks, as revealed by the fact that the order of presentation of the work requests has had no significant effect on the assessments. Note also that all the participants received training in the use of the self-regulation graphic resource, which inevitably implies risk of transference to the rest of the conditions. If we had had the possibility of assessing a higher number of workers with disability at this office or a similar one, organized into independent samples, only the workers who used GS would have received the brief training, and the differences would probably have been greater.

Previous studies on workers with disabilities and the same professional profile (office workers) have reported on how contextual factors of the workplace can significantly affect the processing of information, whether as moderators or mediators of the workers' cognitive resources.[41] In this sense, one of the possible explanations of the benefits of the materials we used in the present research has to do with the greater possibilities that graphic language has to clarify and quickly recuperate information that is relevant to the execution of the task, especially when the worker with disability has functional difficulties with reading and writing. The spatial ordering of the graphic elements, the squares, arrows, and other symbols served as a guide in the process of observation and execution of the tasks. Our findings suggest that training and use of this type of *external representational system* helps to make up for representational and memory limitations of people with intellectual disability, it provides a structure for planning the task, it makes it easier to check that the final product obtained is what was actually requested, and overall it provides valuable support for strategic management of knowledge.[42,43]

Our results are in agreement with previous studies which favour the creation, at low cost, of simple graphic materials to facilitate progressively workers' autonomy, without the need to depend on the assistance of a job coach, and with little time invested by colleagues providing natural support.[11,12] This unquestionable advantage contrasts with the high cost or lower

"manageability" of other material resources of natural support based on the use of technology.

Evidence exists of the effectiveness of very structured verbal-instruction systems to help people with multiple disabilities perform complex tasks independently.[44] These systematic VIs can be successfully provided by the work mate.[45] However, these kinds of instructions may be very different from those that are spontaneously provided by the mates.[37] In some cases, the WID did not seek help when he/she needed it. In other cases, verbal help from colleagues was not sufficient or was too directive for the TDs to be aware of their error and how to resolve it.[46] These limitations affected in particular the supervision phase of the tasks, since the WIDs did not usually spontaneously check the product that they delivered (to be sure that it was as requested).

Limitations

In short, it seems that there is a need to continue searching for alternative support to this type of verbal interaction between workers and their colleagues with intellectual disability, and which can be easily used in the work setting.

In this research, there are some limitations that should be noted. The primary limitations relate to the inferences from this study since not all the participants presented the same personal conditions on disability, and the modest number of participants. A second weakness has to do with the fact that our participants were not randomly drawn from the greater population of workers with mental disabilities. The results are consistent with previous studies. However, in future research the number of WIDs should be broadened in comparable setting. This research will be helpful in providing more evidence-based practices in the field of workplace adjustments for people with disabilities.

Note

1. Table expressed socioeconomic status refers to personal patrimony of origin of the person with intellectual disabilities. It is understood by low socioeconomic status between 10,000€ and 30,000€. Medium-low socioeconomic status between 30,000€ and 60,000€. And middle socioeconomic status between 60,000€ and 120,000€.

Acknowledgements

The Association AFEDIBA of Badajoz (Spain) provided indispensable support in the preparation of this study.

Disclosure statement

This work has been funded by the Junta de Extremadura and Fondos FEDER within the framework of the Research Project "Supported employment. Work support strategies for workers with intellectual disability in tasks requiring self-regulation" (Ref.: IB10050), of 4th Regional Plan of Investigation.

References

- [1] Reid PM, Bray A. Real jobs: the perspectives of workers with learning difficulties. *Disabil Soc.* 1998;13:229–239.
- [2] Cramm JM, Finkenflügel H, Kuijsten R, et al. How employment support and social integration programmes are viewed by the intellectually disabled. *J Intellect Disabil Res.* 2009;53:512–520.
- [3] Griffin SL, Test DW, Dalton B, et al. Long-term supports and services: toward definition, clarification, and implications for the future. *J Vocation Rehabil.* 1995;5:177–185.
- [4] Stephensa DL, Collinsa MD, Dodder RA. A longitudinal study of employment and skill acquisition among individuals with developmental disabilities. *Res Dev Disabil.* 2005;26:469–486.
- [5] Verdugo MA, Jordán de Urríes FB. *Panorámica del empleo con apoyo en España.* Madrid: Real Patronato sobre Discapacidad; 2001.
- [6] Griffin C, Hammis D, Geary T, et al. Customized employment: where we are; where we're headed. *J Vocation Rehabil.* 2008;28:135–139.
- [7] Grossi TA, Banks B, Pinniyei D. Facilitating job site training and supports: the evolving role of the job coach. In: Wehman P, editor. *Supported employment in business: expanding the capacity of workers with disabilities.* St. Augustine (FL): TRN Publications; 2001. p. 75–91.
- [8] Wehman P. Supported employment: what is it? *J Vocation Rehabil.* 2012;37:139–142.
- [9] Rusch FR, Minch KE. Identification of co-worker involvement in supported employment: a review and analysis. *Res Dev Disabil.* 1988;9:247–254.
- [10] Chen CC. Employment outcome and use of natural support in supported employment. Kaohsiung: Shiu-Jing; 2002.
- [11] Cimera RE. Utilizing natural supports to lower the cost of supported employment. *Res Pract Pers Severe Disabil.* 2007;32:184–189.
- [12] Parson MB, Reid DH, Green CW, et al. Reducing job coach assistance for supported workers with severe multiple disabilities: an alternative offsite/on-site model. *Res Dev Disabil.* 2001;21:151–164.
- [13] Rogan P, Hagner D, Murphy S. Natural supports: reconceptualizing job coach roles. *J Assoc Pers Severe Hand.* 1993; 18:275–281.
- [14] Wilson A. 'Real jobs', 'learning difficulties' and supported employment. *Disabil Soc.* 2003;18:99–115.
- [15] Akkerman A, Janssen CGC, Kef S, et al. Perspectives of employees with intellectual disabilities on themes relevant to their job satisfaction. An explorative study using photo-voice. *J Appl Res Intellect Disabil.* 2014;27:542–554.
- [16] Ohtake Y, Chadsey JG. Continuing to describe the natural support process. *J Assoc Pers Severe Hand.* 2001;26:87–95.
- [17] Ellenkamp J, Brouwers E, Embregts P, et al. Work environment-related factors in obtaining and maintaining work in a competitive employment setting for employees with intellectual disabilities: a systematic review. *J Occup Rehabil.* 2016;26:56–69.
- [18] Allen K, Burke R, Howard M, et al. Use of audio cuing to expand employment opportunities for adolescents with autism spectrum disorders and intellectual disabilities. *J Autism Dev Disord.* 2012;42:2410–2419.
- [19] Bambara L, Cole C. Permanent antecedent prompts. In: Agran M, editor. *Student directed learning: teaching self-determination skills.* Pacific Grove (CA): Brookes/Cole; 1997. p. 111–143.
- [20] Lancioni GE, Van den Hof E, Furniss F, et al. Evaluation of a computer-aided system providing pictorial task instructions and prompts to people with severe intellectual disability. *J Intellect Disabil Res.* 1999;43:61–66.
- [21] Mechling LC, Ortega-Hurndon F. Computer-based video instruction to teach young adults with moderate intellectual disabilities to perform multiple step job tasks in a generalized setting. *Educ Train Dev Disabil.* 2007;42:24–37.

- [22] Snell ME, Brown F. Designing and implementing instructional programs. In: Snell M, Brown F, editors. *Instruction of students with severe disabilities*. 6th ed. Upper Saddle River (NJ): Pearson Education, Inc; 2006. p. 111–169.
- [23] Chang YJ, Kang YS, Liu FL. A computer-based interactive game to train persons with cognitive impairments to perform recycling tasks independently. *Res Dev Disabil*. 2014;35:3672–3677.
- [24] Chang YJ, Wang TY, Chen YR. A location-based prompting system to transition autonomously through vocational tasks for individuals with cognitive impairments. *Res Dev Disabil*. 2011;32:2669–2673.
- [25] Cuesta JL, Del Hoyo I, García F. Análisis y adecuación de los programas de empleo con apoyo para personas con autismo. In: Verdugo MA, Jordán de Urríes FB, coord. *Hacia la integración plena mediante el empleo*. Actas del VI Simposio Internacional de Empleo con Apoyo. Salamanca: Instituto Universitario de Integración en la Comunidad; 2002. p. 187–199.
- [26] Taber-Doughty T. Considering student choice when selecting instructional strategies: a comparison of three prompting systems. *Res Dev Disabil*. 2005;26:411–432.
- [27] Cihak DF, Kessler KB, Alberto PA. Generalized use of a handheld prompting system. *Res Dev Disabil*. 2007;28:397–408.
- [28] Cihak DF, Kessler K, Alberto PA. Use of a handheld prompting system to transition independently through vocational tasks for students with moderate and severe intellectual disabilities. *Educ Train Dev Disabil*. 2008;43:102–110.
- [29] Davies DK, Stock SE, Wehmeyer ML. Enhancing independent task performance for individuals with mental retardation through use of a handheld self-directed visual and audio prompting system. *Educ Train Ment Retard Dev Disabil*. 2002;37:209–218.
- [30] Rusch FR, Morgan TK, Martin JE, et al. Competitive employment: teaching mentally retarded employees self-instructional strategies. *Appl Res Ment Retard*. 1985;6:389–407.
- [31] Smith KA, Shepley SB, Alexander JL, et al. The independent use of self-instructions for the acquisition of untrained multi-step tasks for individuals with an intellectual disability: a review of the literature. *Res Dev Disabil*. 2015;40:19–30.
- [32] Sohlberg MM, Fickas S, Hung PF, et al. A comparison of four prompt modes for route finding for community travelers with severe cognitive impairments. *Brain Injury*. 2007;21:531–538.
- [33] Wacker DP, Berg WK. Effects of picture prompts on the acquisition of complex vocational tasks by mentally retarded adolescents. *J Appl Behav Anal*. 1983;16:417–433.
- [34] Canella-Malone H, Sigafos J, O'Reilly M, et al. Comparing video prompting to video modeling for teaching daily living skills to six adults with developmental disabilities. *Educ Train Dev Disabil*. 2006;41:344–356.
- [35] Mechling LC, Gast DL, Gustafson MR. Use of video modeling to teach extinguishing of cooking related fires to individuals with moderate intellectual disabilities. *Educ Train Dev Disabil*. 2009;44:67–79.
- [36] Authors, González E. Evaluación de un programa de apoyo laboral para trabajadores con discapacidad intelectual en tareas con elevada exigencia cognitiva. *Siglo Cero Rev Españ Discapacidad Intelect*. 2008;39:63–81.
- [37] Becerra MT, Montanero M, Lucero M. Empleo normalizado con apoyo. Investigación de diferentes recursos de apoyo natural a trabajadores con discapacidad intelectual en tareas laborales que requieren autorregulación. Olivenza: FUTUEX y Observatorio Estatal de la Discapacidad; 2012.
- [38] Holwerda A, van der Klink JJ, de Boer MR, et al. Predictors of work participation of young adults with mild intellectual disabilities. *Res Dev Disabil*. 2013;34:1982–1990.
- [39] Rose J, Saunders K, Hensel E, et al. Factors affecting the likelihood that people with intellectual disabilities will gain employment. *J Intellect Disabil*. 2005;9:9–23.
- [40] Su CY, Lin YH, Wu YY, et al. The role of cognition and adaptive behavior in employment of people with mental retardation. *Res Dev Disabil*. 2008;29:83–95.
- [41] Rolo G, Hernández-Fernaund E, Díaz-Cabrera D. Impacto de las condiciones físico-ambientales percibidas sobre la carga mental de trabajo: un estudio exploratorio en empleados de oficina. *Psycology*. 2010;1:333–342.
- [42] Danielson RW, Schwartz NH, Lippmann M. Metaphorical graphics aid learning and memory. *Learn Instruct*. 2015;39:194–205.
- [43] Pérez Echevarría P, Martí E, Pozo JI. Los sistemas externos de representación como herramientas de la mente. *Cult Educ*. 2010;22:133–147.
- [44] Lancioni GE, Singh NN, O'Reilly MF, et al. A verbal-instruction system to help persons with multiple disabilities perform complex food- and drink-preparation tasks independently. *Res Dev Disabil*. 2011;32:2739–2747.
- [45] Wacker DP, Berg WK. Use of peer instruction to train a complex photocopying task to moderately and severely retarded adolescents. *Anal Intervent Dev Disabil*. 1984;4:219–234.
- [46] Lucero M, Becerra MT, Montanero M. Análisis de las ayudas verbales de un apoyo natural antes y después de una actividad de asesoramiento. Estudio de un caso. *Siglo Cero. Rev Española Sobre Discapacidad Intelect*. 2014;45:62–76.

Appendix. Assessment rubric for the task photocopying

Processes	Operations ^a	Levels of execution
1. Understanding-planning	1. Listen and, if necessary, write down the request	<ol style="list-style-type: none"> Does not maintain eye contact or does not pay attention. Continues with, or interrupts, the instructions with another activity. In the case of a complex and/or long request, does not take note. Listens, but when request is complex and/or long, does not take note. Listens, but does not write down the information correctly, or writes only part of it, or takes too long. Listens, and in the case of a complex and/or long request, writes it down quickly and correctly.
	2. Check the information and, if necessary, ask for repetition of the information	<ol style="list-style-type: none"> Does not ask for repetition of the information, does not check or paraphrase content of request. Gets the information wrong or does not request it clearly. Checks the information very slowly. Checks the information correctly and quickly and, when necessary, requests repetition.
	3. Plan when the task is to be done	<ol style="list-style-type: none"> Forgets to carry out the task. Is not capable of carrying out the task in the allotted time. Carries out the task too soon (having left another more urgent task). Carries out the task in the allotted time.
2. Execution	4. Remember and interpret the request	<ol style="list-style-type: none"> Forgets the content of the request (and does not consult the log sheet). Remembers the content of the request but does not know how to interpret the instructions, and does not ask work mates for help. Interprets wrongly the information on the log sheet, but asks a work mate for help. Remembers and interprets correctly the request.
	5. Switch on machine and put in the code number	<ol style="list-style-type: none"> Does not switch machine on or does not remember the code number and takes too long to seek help. Does not remember the code number and seeks help. Does not remember the code number and takes too long to consult it. Remembers the code number or consults it quickly and without help.
	6. Put paper on the in-tray	<ol style="list-style-type: none"> Does not remember how to place the paper in the in-tray and the photocopies come out wrongly. Does not remember how to place the paper in the in-tray and takes too long to seek help. Does not remember how to place the paper in the in-tray and seeks help. Places the paper correctly in the in-tray.
3. Assessment and delivery of the product	7. Select the correct functions on the control panel	<ol style="list-style-type: none"> Selects the wrong functions on the photocopier. Selects some of the wrong functions on the photocopier and does seek help. Selects some of the wrong functions on the photocopier but seeks help. Selects the right functions for the request.
	8. Check that the material is what was requested	<ol style="list-style-type: none"> Does not check that the photocopies are well made and correspond to those requested. Checks that the photocopies are well made and correspond to those requested, but is wrong. Checks that the photocopies are well made and correspond to those requested, but takes too long. Checks and ensures that the photocopies are well made and correspond to those requested.
	9. Deliver the requested material correctly	<ol style="list-style-type: none"> Does not remember to deliver the photocopies. Delivers the photocopies late and to the wrong person or place. Delivers the photocopies to the right person and the right place, but not on time. Delivers the photocopies correctly.

^aNote. This is the rubric used in Study II. In Study I operations 5 and 6 were integrated as one.